

**Dottorato di Ricerca in Fisica dell'Università degli Studi di Messina**

28 Settembre 2011, ore 15.00, Aula E. Majorana, Dip.to di Fisica,  
V.le F. Stagno d'Alcontres 31, S. Agata, Messina

Seminar title:

**“Laser-generated plasma and its applications”**

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**Abstract**

Plasma production by laser ablation (PLA) of solid targets in vacuum is a topic of growing interest for many applications in different fields, such as diagnostics techniques, ion acceleration, nuclear physics, material processing and cultural heritage.

Key plasma parameters, such as equivalent temperature, density, acceleration voltage, ion charge state and fractional ionization, are evaluated using appropriate diagnostics instruments, such as ion collector, ion energy analyzer, mass quadrupole spectrometer, optical spectroscopy. These tools give us essential information to understand the mechanism of non-equilibrium plasma development and kinetics.

A special interest of PLA concerns the ion acceleration with high-electrical fields generated in sub-millimeter space by hot and dense laser-generated non equilibrium plasmas. This new method of producing ion beams is more appealing than classical techniques that use large accelerator facilities, and, recently, it has been investigated in order to develop a new generation of laser ion sources (LIS).

Furthermore, when extremely intense laser beams interact with deuterated targets, D-D nuclear fusion reactions can be achieved in hot and dense plasmas.

Many laboratories are using PLA in order to grow thin films as coverage of different substrates. The film properties, such as stoichiometry, roughness, grain size, crystallinity and porosity, can be modified on the basis of the used laser wavelength, pulse intensity, pulse width, substrate nature, irradiation environment conditions, etc. The technique is useful in many scientific fields, such as microelectronics, chemistry, biomedicine and metallurgy.

Laser Ablation coupled to Mass Quadrupole Spectrometry (LAMQS) is a new technology recently developed for the depth profile and compositional analysis of different solid materials placed in vacuum. It is very helpful in the field of cultural heritage in order to compare their composition and morphology and to identify their origin and the type of manufacture.